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Notes on Plumage Changes in the Bald Eagle.

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(Plates I-IV).

In August of 1930 a young Southern Bald Eagle (*Haliaeetus leucocephalus leucocephalus* (Linnaeus)), just out of the nest and barely able to fly, was captured on Little St. Simon's Island, Georgia, by Philip Berolzheimer, of New York. In December of the same year, the young bird was brought north by Albert C. Benninger, of Brooklyn. It was kept in Forest Park, Queens, New York City, until June, 1931, when it was lent to the Girl Scout camp at Iona Island, Rockland County, New York. On September 2, 1931, the bird was presented to the New York Zoological Park and became the subject of the following notes.

In past years, we had made several attempts to check the progressive plumages of young Bald Eagles but always some catastrophe overtook the bird before the investigation had gone very far. Consequently, on the arrival of this specimen, no notes were made. However, in the autumn of 1933, we were able to plan indoor winter accommodation for the Bald Eagles and were so confident that greater longevity could be obtained that notes on our young individual were made. On October 10, 1933, the bird being three years old and in its fourth year, the body plumage was blackish-brown in general, the breast and lower parts much mixed with white. Forehead and throat were streaked with white, and the tail (Fig. 1) was heavily blotched with gray but with no pure white. The iris was dark brown and the beak greenish-black.

On January 29, 1934, it was noted that the white streaks on the forehead had spread over the entire crown. The throat had become nearly clear white and a band of white extended to the nape. Between this band and the mottled area of the crown, was a parallel dark band, extending from the lores to the nape and passing through the eyes. During the following summer, this pattern was entirely lost. On September 2, 1934, the head, neck and throat were grayish-white, clearest on the throat but elsewhere blotched with blackish-brown, more heavily on the hind neck. The tail (Fig. 2) was extensively blotched with gray but still without clear white. The iris was light brown and the beak had become light

olive, with a hint of yellow. The voice, too, was changing, for while the bird still began his call with the harsh notes of immaturity, he ended with the clear challenge of the adult.

It was during the autumn of 1935, when the bird was five years old and in its sixth year, that it assumed what might be considered its first adult plumage. On November 1 of that year, the head and neck were recorded as pure white. The tail (Fig. 3), also, was now predominately white, although still heavily blotched with blackish-brown. The iris had acquired the pale yellowish-white of the adult and the bill, too, had become clear, pale yellow. The harsh notes had disappeared from the voice, which was now entirely clear.

The tail grown during the summer of 1936 (Fig. 4) was more clearly white but still showed a considerable flecking of blackish-brown, particularly on the shafts. On November 1, 1936, it was noted that while upper and lower tail coverts were mainly white, both were heavily stippled with brown.

In November of 1937, the upper and lower tail coverts were recorded as entirely white. The tail of this year (Fig. 5) showed a considerable reduction in the extent of dark stippling, though this was still present.

In 1938 (Fig. 6), 1939 (Fig. 7) and 1940 (Fig. 8), the markings on the rectrices became progressively reduced. But it was not until 1940, when the bird was ten years old and in its eleventh year, that all stippling disappeared from the vanes. Even then, as may be seen in the photograph of the tail *in situ* (Fig. 8), faint dark markings were still present on the shafts of some feathers.

It seems probable that there may be a considerable individual variation in the extent of dark markings on the shafts of the rectrices. A Bald Eagle received at the Zoological Park on March 1, 1927, had the head and tail "white." Examination of this bird's tail, after its death on June 17, 1940, when it must have been at least eighteen years old, showed heavy streaking of the shafts.

Examination of the dates on which feathers were cast seems to indicate no definite procedure, except that in the last four years the outer pair dropped first and simultaneously or almost so. The earliest date for the casting of the first rectrice was April 19 (1934); the latest, June 21 (1934 and 1936). The earliest date for the casting of the last rectrice was July 30 (1934); the latest, September 25 (1938). Dates assigned to the mounted feathers indicate the time at which they were cast; in each case, they were grown in the previous year. Fig. 8 shows the tail of the living bird on December 12, 1940. The tail was grown in 1940.

SUMMARY.

A Southern Bald Eagle (*Haliaeetus leucoccephalus leucoccephalus* (Linnaeus)), hatched in

1930, was kept in the New York Zoological Park. In the autumn of 1935, when the bird was five years old and in its sixth year, the head and neck became pure white and the tail nearly so. It was not until 1940, when the bird was ten years old and in its eleventh year, that blackish stippling disappeared from the vanes of the rectrices.

ACKNOWLEDGEMENT.

The dating and mounting of the feathers shown in the accompanying photographs were done by Herbert D. Atkin, who was a Keeper in the Department of Birds of the New York Zoological Park from 1905 to 1940, when he retired on pension. His painstaking cooperation made possible their presentation here.

EXPLANATION OF THE PLATES.

PLATE I.

- Fig. 1. *Haliaeetus l. leucoccephalus*. 1933 tail feathers (bird 3 years old; in 4th year) molted in 1934.
 Fig. 2. 1934 tail feathers (bird 4 years old; in 5th year) molted in 1935.

PLATE II.

- Fig. 3. 1935 tail feathers (bird 5 years old; in 6th year) molted in 1936.
 Fig. 4. 1936 tail feathers (bird 6 years old; in 7th year) molted in 1937.

PLATE III.

- Fig. 5. 1937 tail feathers (bird 7 years old; in 8th year) molted in 1938.
 Fig. 6. 1938 tail feathers (bird 8 years old; in 9th year) molted in 1939.

PLATE IV.

- Fig. 7. 1939 tail feathers (bird 9 years old; in 10th year) molted in 1940.
 Fig. 8. Tail feathers of the living bird (10 years old; in 11th year) photographed *in situ* on December 12, 1940.